

REMARKS

Claims 39 and 41-74 are pending in this application. Claims 39, 67 and 74 have been amended. Claim 40 has been canceled and its limitations have been incorporated in amended independent claim 39. No new matter has been introduced. The title has been amended to more clearly describe the subject matter of the claimed invention. Applicants acknowledge with appreciation the allowance of claims 59-68, 71 and 72.

The drawings stand objected to as "Figures 1 and 2 should be designated by a legend such as -Prior Art-." (Office Action at 2). Applicants submit that replacement drawings labeling Figures 1 and 2 as "Prior Art" will be submitted shortly together with formal drawings which are being currently prepared.

Claims 43, 46, 69, 70 and 73 stand rejected under 35 U.S.C. 112, as there is no antecedent basis for the limitation "said act" in each of these claims. (Office Action at 2). Independent claims 39 and 67 have been amended to recite a "method of forming a photodiode for a pixel sensor cell, said method comprising the acts of" and to overcome, therefore, the claim rejections. Applicants submit that all pending claims are now in full compliance with 35 U.S.C. 112.

Claims 39, 42, 43, 46, 47 and 74 stand rejected under 35 U.S.C. 102(e) as being anticipated by Rhodes (U.S. Application Publication No. 2004/0201072) ("Rhodes"). This rejection is respectfully traversed.

The claimed invention relates to a method of forming a photodiode for a pixel cell. As such, amended independent claim 39 recites a "method of forming a photodiode for a pixel sensor cell" by *inter alia* "forming a gate of a transistor over said substrate," "forming a first doped layer of a first conductivity type in said substrate"

and "forming a doped region of a second conductivity type in said doped layer."

Amended independent claim 39 also recites "forming a second doped layer of said first conductivity type in said substrate by implanting ions of said first conductivity type at an incidence angle with said substrate different than a zero degree angle in an area of said substrate defined between said gate and said at least one isolation region, said gate acting as an implant mask for said incidence angle." Amended independent claim 39 further recites that the second doped layer is "in contact with said isolation region and being displaced laterally from an electrically active portion of said gate by a distance of about 100 to about 2,500 Angstroms."

Amended independent claim 74 recites a "method of forming a photodiode for a pixel sensor cell" by *inter alia* "forming at least one isolation region in a substrate," "forming a gate of a transistor . . . spaced apart from said at least one isolation region" and "forming a first doped layer of a first conductivity type in said substrate."

Amended independent claim 74 also recites "forming a doped region of a second conductivity type in said doped layer" and "forming a second doped layer of said first conductivity type in said substrate by implanting ions of said first conductivity type at an incidence angle with said substrate of about 3 degrees to about 40 degrees in an area of said substrate defined between said gate and said at least one isolation region."

Amended independent claim 74 further recites that the second doped layer is "in contact with said isolation region and being displaced laterally from an electrically active portion of said gate by a distance."

Rhodes relates to an "imager pixel arrangement having a light shield over the pixel circuitry, but below the conductive interconnect layers of the pixel." (Abstract). Rhodes teaches that "[t]he light shield can be a thin film of opaque (or nearly-opaque) material with openings for contacts to the underlying circuitry" and that "[a]n aperture

in the light shield exposes the active region of the pixel's photoconversion device."
(Abstract).

Rhodes does not disclose all limitations of claims 39, 42, 43, 46, 47 and 74. Rhodes is silent about the formation of a second doped layer which is "displaced laterally from an electrically active portion of said gate by a distance of about 100 to about 2,500 Angstroms," as amended independent claim 39 recites. Rhodes also fails to disclose, teach or suggest "forming a second doped layer . . . by implanting ions of said first conductivity type at an incidence angle with said substrate of about 3 degrees to about 40 degrees in an area of said substrate defined between said gate and said at least one isolation region," as amended independent claim 74 recites.

Rhodes teaches the formation of a "p-n-p structure made of the underlying p-type substrate 10, an n-type region 18 within the p-type well 16, and a p-type layer 20 above the n-type region 18." (Rhodes at ¶ [0037]). Rhodes teaches that "[t]he layers of the photodiode 14 (i.e., layers 10, 18, and 20) can be formed . . . with a patterned photoresist 110 and another ion implantation 112 of a second conductivity type." (Rhodes at ¶ [0037]). Rhodes also teaches that "[a]n angled implant 112 can be utilized to form region 18 to achieve certain spatial characteristics of the photodiode 14." (Rhodes at ¶ [0037]). However, Rhodes is silent about the formation of the layer 20, which would arguably correspond to the "second doped layer" of the claimed invention, by an angled implantation "at an incidence angle with said substrate of about 3 degrees to about 40 degrees" (claim 74), or spaced from a gate structure of a transistor "by a distance of about 100 to about 2,500 Angstroms" (claim 39). For at least these reasons, Rhodes fails to anticipate the subject matter of claims 39, 42, 43, 46, 47 and 74, and withdrawal of the rejection of these claims is respectfully requested.

Claims 41, 44 and 45 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Rhodes. This rejection is respectfully traversed.

Applicants submit that the earliest effective filing date of the present application is September 5, 2003. U.S. Application Publication No. 2004/0201072 ("Rhodes") was filed on April 10, 2003 and published on October 14, 2004. Rhodes thus qualifies as prior art only under 35 U.S.C. § 102(e). In addition, the subject matter of Rhodes and of the claimed invention were, at the time the invention was made, subject to an obligation of assignment to the same entity: Micron Technology, Inc. The Assignment for this application was recorded in the Patent and Trademark Office on September 5, 2003, on Reel 014233, Frame 0324. The Assignee of Rhodes is shown on the face of the reference. Therefore, section 35 U.S.C. § 103(c) applies. According to MPEP § 706.02(l)(1), "[e]ffective November 29, 1999, subject matter which was prior art under former 35 U.S.C. 103 via 35 U.S.C. 102(e) is now disqualified as prior art against the claimed invention if that subject matter and the claimed invention 'were, at the time the invention was made, . . . subject to an obligation of assignment to the same person.'" Accordingly, Rhodes is not a valid prior art reference and should be excluded under 35 U.S.C. § 103.

Allowance of all pending claims is solicited.

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